Impervious Area Disconnection Panel: Literature Review & Synthesis

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9-15-2015

State Stormwater Manuals

- Consider slope, soil type, receiving area size, drainage area size, and vegetation
- Runoff Reduction (as part of new development activities)
  - DC – 15, 30, or 45 gallons reduced per 100 ft^2 of receiving area (depending on receiving characteristics); WV is similar
  - NY – Effectively remove impervious from runoff calculations by adjusting the site runoff coefficient (Rv)
  - MD – use environmental site design (ESD) sizing criteria (Curve Number (CN) reduction)
  - VA – 25% or 50% runoff reduction for C/D or A/B soils, respectively (assuming design specifications are followed)

Soil Conditioning

- Decompaction
  - Tillage
  - Subsoiling
  - Aeration
  - Etc.
- Amendments
  - Compost
  - Mulch
  - Sand
  - Polyacrylamide
  - Etc.

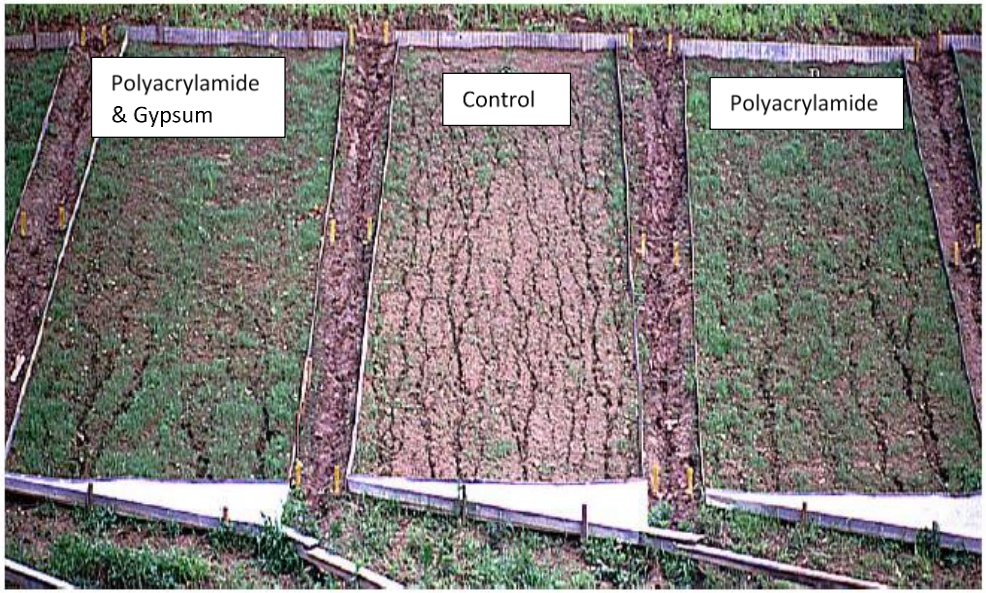
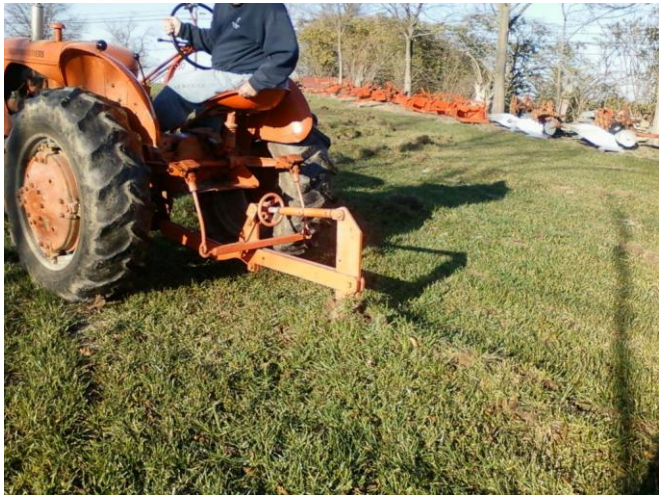


Figure 6. Photograph of three representative plots at the RDF natural rainfall site with treatments (left to right) of PAM and gypsum (PG), control (C), and PAM (P). This picture was taken on 19 June 1998, three weeks after seeding. Intense storms produced 130 mm of rainfall during this three–week period. Notice the reduced rilling and improved grass growth on the treated plots.

Flanagan, Chaudhari, and Norton (2002)

Soil Decompaction

- Uses
  - Address hardpan
  - Reduce impacts of surface sealing
  - Mitigate compaction from vehicular traffic during construction
- Runoff Reduction Benefits (at least temporary)
  - 30% to 80% runoff reduction
  - Decreased bulk density (Bernier et al., 1989)
  - Increased infiltration (Clark et al., 1993)



Subsoiling image from http://www.allischalmers.com/forum/forum_posts.asp?TID=59802&title=playing-with-no-4-subsoiler-pics

Soil Amendments

- Uses
  - Tight soil
  - Poor soil health
  - High erosion potential
- Runoff Reduction Benefits
  - 40% to 90% runoff reduction
  - Decreased bulk density (Dung et al., 2011)
  - Compost: Increased infiltration (Felton, 1995)

Gypsum Application Image from http://www.gypsoil.com/news-and-events/media-room?recid=16

Vegetative Cover Management

- Goal to provide long term benefits
  - Woltmade (2010) saw increasing infiltration with increasing neighborhood age
  - Schueler (2000) suggests long term soil structure enhancement with trees and shrubs
  - Can help resist recompaction (Haynes et al., 2013)

Potential to Estimate Benefit of Pervious Area Modification

- Runoff Reduction
  - Use a change in NRCS CN to estimate runoff reduction
    - Potential to estimate CN
      - Adjustments from Woltmade (2010)
      - Saturated infiltration rates (Chong & Teng, 1986; Christianson et al., 2015)
  - Use an infiltration & runoff model (Mueller & Thompson, 2009)
    - Uses long term rainfall, the ratio of roof area to lawn area, and measured lawn infiltration rates
  - Estimated Soil Water Characteristics
    - Use the Soil-Plant-Air-Water (SPAW) model in the absence of measured soil hydraulic characteristics (Saxton & Rawls, 2009)

Potential to Estimate Benefit of Pervious Area Modification

- Nutrient Reduction
  - Use the *Recommendations of the Expert Panel to Define Removal Rates for Urban Stormwater Retrofit Projects* (SREP, 2012) to couple runoff reduction and nutrient reduction